

244

6-2

12

71-01589

MCR-70-339

get DRA

CONTRACT NAS10-7308

DEVELOPMENT OF A TEST AND FLIGHT
ENGINEERING ORIENTED LANGUAGE

CIRCULATION COPY

MAY 18 1971

PHASE I ORAL PRESENTATION MATERIAL

JOHN F. KENNEDY SPACE CENTER
NASA LIBRARY

W. F. Kamsler
C. W. Case
E. L. Kinney
J. Gyure

Martin Marietta Corporation
Denver Division
Box 179, Denver, Colorado 80201

August 1970

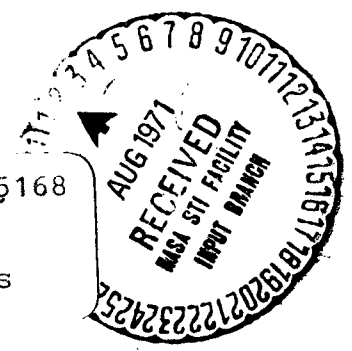
Prepared for
National Aeronautics and Space Administration
John F. Kennedy Space Center

(NASA-CR-125312) DEVELOPMENT OF A TEST AND
FLIGHT ENGINEERING ORIENTED LANGUAGE.
PHASE 1: ORAL PRESENTATION MATERIAL W.F.
Kamsler, et al (Martin Marietta Corp.)
Aug. 1970 48 p (NASA CR 125312)

N72-15168

Unclas
12743

CSCL 09B G3/08



Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

8pt-65211

DEVELOPMENT OF A TEST AND
FLIGHT ENGINEER ORIENTED LANGUAGE
for
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
KENNEDY SPACE CENTER, FLORIDA
CONTRACT NAS10-7308
PHASE I ORAL PRESENTATION
26 AUGUST 1970

MEMBERS OF THE STUDY TEAM

MARTIN MARIETTA

DENVER DIVISION

WILLIAM F. KAMSLER - PROGRAM MANAGER

C. WILLIAM CASE

J. GYURE

EDMUND L. KINNEY

STUDY OBJECTIVES

MARTIN MARIETTA
DENVER DIVISION

1. PERFORM A STUDY OF THE EFFECTIVITY OF TEST ENGINEER ORIENTED LANGUAGES THAT HAVE BEEN EMPLOYED, OR HAVE BEEN PROPOSED FOR EMPLOYMENT, FOR TEST AND CHECKOUT AUTOMATION OF SPACE VEHICLE, AIRCRAFT, AND OTHER RELATED SYSTEMS.
2. ANALYZE AND DEVELOP THE CHARACTERISTICS REQUIRED FOR A LANGUAGE FOR THE SPACE SHUTTLE APPLICATION.
3. PRODUCE A COMPLETE LIST OF LANGUAGE REQUIREMENTS (SPECIFICATIONS) CONSISTENT WITH THE DESIGN CONCEPTS OF THE SPACE SHUTTLE.

STUDY PHASES

MARTIN MARIETTA

DENVER DIVISION

PHASE I

REVIEW THE PAST AND CURRENT DEVELOPMENT
EFFORT RELATED TO SPACE VEHICLE AUTOMATIC
CHECKOUT LANGUAGE

PHASE II

DEVELOP THE NEEDED CHARACTERISTICS FOR A
SPACE SHUTTLE AND FLIGHT ENGINEER ORIENTED
LANGUAGE

PHASE III

PRODUCE A LIST OF LANGUAGE REQUIREMENTS
(A SPECIFICATION) FOR THE BASIC DESIGN OF
THE LANGUAGE

1. CHECKOUT EQUIPMENT ORIENTED
2. UNIT UNDER TEST ORIENTED

DESIGNED TO PROVIDE MORE DIRECT PATH FROM TEST ENGINEER TO
RCA-110A COMPUTER OBJECT PROGRAM USED IN SATURN PROGRAM

ATOLL PROGRAM STATEMENTS

MARTIN MARIETTA
DENVER
DIVISION

1	NAME	IBATH
*FLT CONTROL PREPS AS-699 REV3 8/26/0		COMPl
2	CODE	A4
*THE FOLLOWING ARE THE ASSIGNED FLAG CONDITIONS		
*	FLAG 6	THE FCC SPATIAL COMPARATOR DID NOT SET
*	FLAG 10	GYRO OUTPUT WAS NOT WITHIN TOLERANCE
3	MLSR	ILUVV, SCOW
4	DISA	MDO, 378, 379, 694, 1799, 1801, 1803, 1890
5	DECL	P/SPAT/COMP, DP1A0-12J06-01 P/CSP/POWER/ON, DP1A0-12J01-06
6	TERM	MDO-1790, MDO+378, MDO-1803 MDO-1890, MDO-378

ATOLL PROGRAM STATEMENTS



```

7  DIS01                                MDO,1801                (PITCH SELECT ON)
8  DELY1                                500OPP/SPAT/COMP,B001100
9  SFLG1                                F6
10 DPLY1                                *PITCH SPATIAL COMPARATOR DID NOT SET*
11 DIS01                                500MDO,378                (ZERO CMD ON)
12 DIS00                                MDO,1790                (CONTROL RATE GYRO ON)
13 MDSO                                MDO,-1890,-1803
14 TFLGO                                F6,B002500
15 DPLY                                *OPTIONS*
                                   1CONTINUE
                                   2REPEAT COMPARISON SET
                                   3TERMINATE
                                   ENTER $PR AND OPTION DESIRED
16 SEMIR                                4,B001700,B001900,B002300,
                                   B002400
17 DPLY                                *OPTION ENTERED 1*
18 GOTO                                B002500
19 DPLY                                *OPTION ENTERED 2*
20 DIS01                                500MDO,379                (COMPARATOR RESET)
2050SFLGO                                F6
21 GOTO                                B000700
22 DPLY                                *OPTION ENTERED3*
23 GOTO                                B006100
24 SEMI                                PROGRAM HAS LAPSED TO SEMI
                                   BY KEYBOARD REQUEST
2450GOTO                                B002400

```


ATOLL PROGRAM STATEMENTS

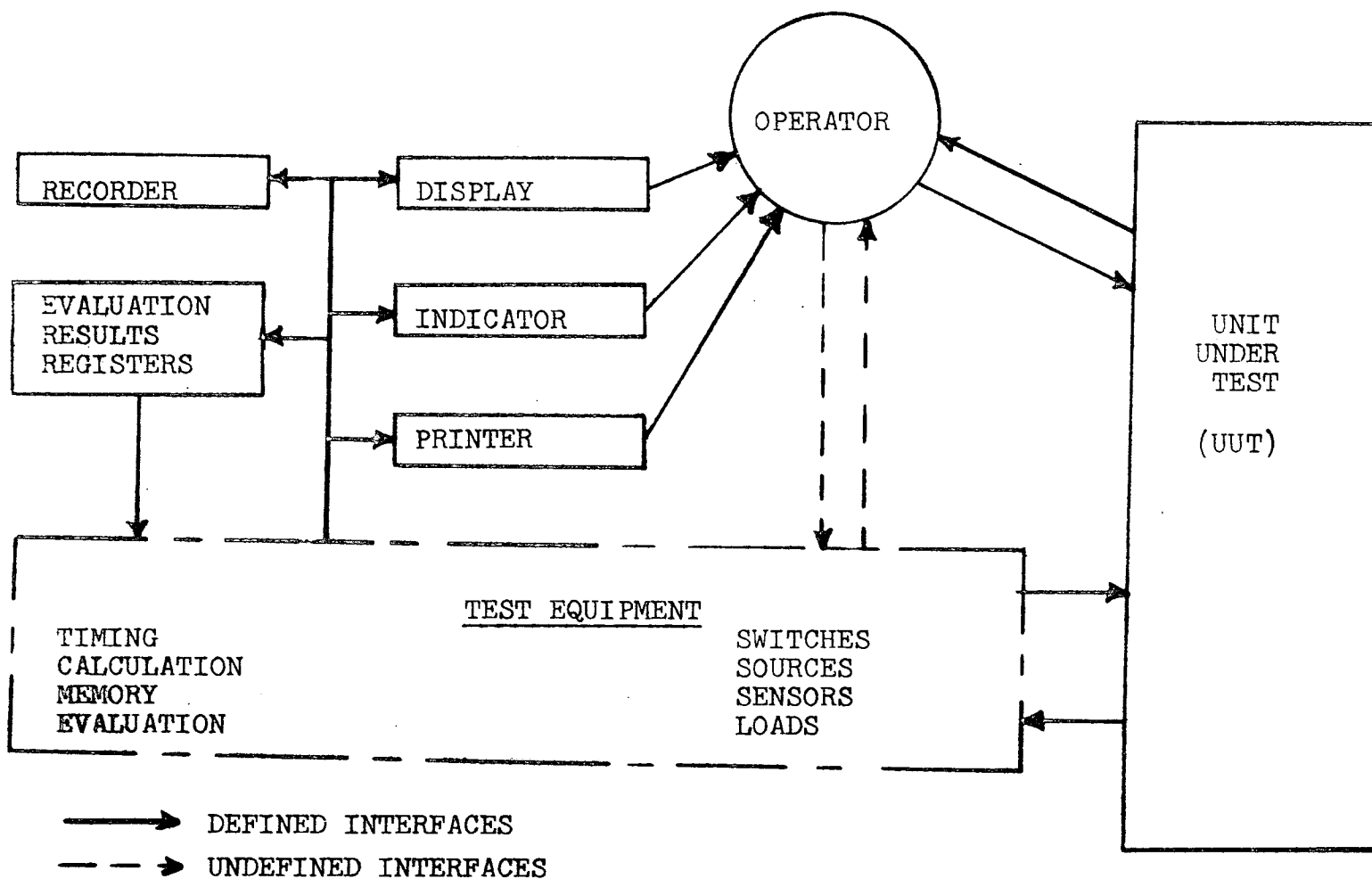
MARTIN MARIETTA
NEWER
DIVISION

```

25  SETT                      TCA
26  RGMT                      SCOV
27  DISO1                    3000MDO,694                (I.U.RAMP POS)
28  TESTW 3.25 0.25 0.25VDC  AV10,PREF/PITCH,B003300
29  DPLY1  *PITCH REF GYRO   OUTPUT WAS NOT IN 2TO4DEG/*
          *SEC BAND AFTER RAMP FOR 3 SECS
30  SFLG1                      F10
    .
    .
    .
    .
    .
    .
    .
61  DPLY  TEST HAS BEEM TERMINATED VIA OPERATOR
          SELECTION OF TERMINATE OPTION
62  MSFG                      F,-6,-10
999999END

```

DEVELOPED FOR BLACK-BOX TESTING WITH UNKNOWN TEST SYSTEM.
EACH TEST PROGRAM COMPLETELY AUTONOMOUS.
COMPLETE SPECIFICATION OF EXTERNAL (UUT) INTERFACES, ELECTRICAL,
PNEUMATIC, ETC.
ENGINEER AND TECHNICIAN ORIENTED WITH EMPHASIS ON READABILITY
WITHOUT SIGNIFICANT TRAINING.
ENGINEERING-LIKE PHRASES IN STATEMENTS, WITH LARGE BUT FAMILIAR
VOCABULARY.
SPECIFICATION ORGANIZED FOR RAPID REFERENCING AND GUIDANCE.
ALL IDENTIFIERS ENCLOSED IN QUOTE MARKS.
NO PARALLEL PROGRAM CAPABILITY
NO PROVISIONS FOR "POSTING" SUBROUTINES.



ATLAS STATEMENT CONSTRUCTIONS

MARTIN MARIETTA
DENVER
DIVISION

ATLAS SPECIFICATION SYNTAX DIAGRAM (SIMPLIFIED)

fstatno ✓ APPLY, #noun, #[statement characteristics], #[conn] \$

WHERE:

fstatno=FLAG AND STATEMENT NUMBER

✓ =SINGLE SPACE ONLY

=ONE OR MORE SPACES

noun =DC SIGNAL, AC SIGNAL, HEAT, SYNCHRO, MANOMETRIC, ETC.

[statement characteristics] =VOLTAGE, CURRENT, TEMP, PRESSURE, ETC.
WITH MODIFIERS MAX, MIN, ERRLMT, RANGE, ETC.,
value AND units.

= # one characteristic# modifier# value-units#

[conn] = CNX HI J1-2 LO J1-1, CNX PITOT-PORT,
CNX POINT-A, (LOCATIONS ARE UUT NOMENCLATURE)

\$ = STATEMENT TERMINATOR

C IN ALL STATEMENTS, ERRLMT REFERS TO THE ACCURACY
REQUIRED OF THE TEST SYSTEM IN PROVIDING OR MEASURING
THE CHARACTERISTIC §

100101 APPLY, DC SIGNAL,
VOLTAGE 28.5V ERRLMT + -2.0V,
CURRENT MAX 300MA,
CNX HI JI - /A LO JI - 23 §

100102 VERIFY, (VOLTAGE), DC SIGNAL,
VOLTAGE ERRLMT + -.01V,
TEST -EQUIP-IMP MIN 10KOHMS,
SAMPLE WIDTH MIN 200MS,
UL 30.5V
LL 26.5V,
CNX HI JI - /A
LO JI -23 §

100103 REMOVE, STEP 100101 §

100103 GOTO STEP 109901 IF LO, STEP
100109 IF GO §

C PREAMBLE STATEMENTS\$

000101 SPECIFY, SOURCE, DC SIGNAL,
VOLTAGE 28.5V ERRLMT +-2.0V,
CURRENT MAX 300MA,
AC COMP MAX 100MV\$

000201 DEFINE, 'DISCRETE 314', SOURCE, DC SIGNAL,
CNX HI J1-/A
LO J1-23\$

C THE FOLLOWING ARE ALTERNATIVES IN PROCEDURES\$

010023 APPLY, 'DISCRETE 314'\$

010023 APPLY, DC SIGNAL, CNX HI J1-/A LO J1-23\$

010023 APPLY, DC SIGNAL, VOLTAGE 28.5V ERRLMT +-2.0V
CURRENT MAX 300MA, AC COMP MAX 100MV,
CNX HI J1-/A LO J1-23\$

C IN PREAMBLE\$

001090 DEFINE, 'CALCHECK', PROCEDURE,
('ENABLE', 'STIM V',) RESULT ('A')\$

001091 APPLY, 'ENABLE'\$

001092 APPLY, DC SIGNAL, VOLTAGE
'STIM V', CNX HI J1-1 LO J1-2\$

001093 MEASURE, (VOLTAGE), DC SIGNAL,
VOLTAGE MAX 11V ERRLMT +-0.1PC,
CNX HI J1-14 LO J1-23\$

001094 SAVE, 'MEASUREMENT', 'A'\$

001095 END, 'CALCHECK'\$

C LATER IN PROCEDURE\$

100118 PERFORM, 'CALCHECK',
'DISC 314', 4.0V, 'CAL .8FS'\$

100128 PERFORM, 'CALCHECK', TABLE
3 VAR 3 TIMES,
'DISC 314', 0.0V, 'CAL 0'
'DISC 314', 2.5V, 'CAL .5FS'
'DISC 314', 5.0V, 'CAL FS'\$
C ENABLE STIM V A \$

102090 CALCULATE, 'DRIFT' = 'V1' - 'V2'\$
92 COMPARE, 'DRIFT', LT 3.1V\$
93 REPEAT, STEP 100080 IF NO GO\$
95 REPEAT, STEP 100046 THRU STEP
100050, 13 TIMES\$
102105 REPEAT, STEP 100046, STEP
100076, STEP 100104\$
102200 MEASURE, TIME INTERVAL\$
01 START WHEN, (VOLTAGE), 'INTEG. OUT',
EQ 1.0V, MAX TIME 2.0 SEC\$
02 APPLY, DC SIGNAL, 'DISC 315'\$
03 STOP WHEN, (VOLTAGE), 'INTEG. OUT'.
EQ 3.5V, MAX TIME 15 SEC\$
04 GOTO, STEP 102207 IF NOGO\$
05 COMPARE, 'MEASUREMENT', UL 8.5
SEC LL 5.5 SEC\$
06 GOTO, STEP 102300 IF GO\$
07 PRINT, MESSAGE,
FAILED 1022 INTEGRATER SLOPE TEST\$

S104400 ADJUST, DC SIGNAL,
UUT-1MP MIN 35KOHMS, VOLTAGE
RANGE 0.0V TO 100V ERRLMT \pm 0.1V
BY 0.1V
RATE 1.0V/SEC,
CNX HI J3-47
LO J1-23\$

S 01 TO REACH, (VOLTAGE), DC SIGNAL,
VOLTAGE ERRLMT \pm 10MV, EQ 400MV,
CNX HI J4-13
LO J1-23\$

02 VERIFY, (VOLTAGE), DC SIGNAL,
UL 72.5V LL69.4V,
CNX HI J3-47 LO J1-23\$

110004 WAIT FOR, MANUAL INTERVENTION\$

06 WAIT FOR, 3.0MIN BEFORE STEP
110100\$

ATLAS MISC STATEMENTS

MARTIN MARIETTA

DENVER DIVISION

200129 REMOVE,STEP 100102\$

200131 REMOVE,CNX HI J2-47 J1-3
J2-13 J5-12\$

200245 REMOVE,'SIGNAL LIST 12'\$

200302 APPLY,AC SIGNAL,VOLTAGE
+12.0 +J16.OV,FREQ 400HZ,
DISTORTION MAX 2.0PC,
CNX HI J4-16
LO J4-23
REF HI J4-1
LO J4-23\$

200401 CALCULATE,'F42'=1

200622 COMPARE,'F42',EQ 1\$

200623 GOTO,STEP 202206 IF EQ\$

200624 PRINT,MESSAGE,

ALTERNATE TEST REQUIRED

REF. F42 OFF \$

PROCEDURE - ORIENTED LANGUAGE FOR AEROSPACE APPLICATIONS.

A SUBSET OF SPACE PROGRAMMING LANGUAGE (SPL)

PRIMARY APPLICATIONS - GUIDANCE AND NAVIGATION.

ORIENTED TO ARITHMETIC AND LOGICAL MANIPULATIONS.

DESIGNED FOR USE BY A PROFESSIONAL PROGRAMMER.

NOT A TEST-ORIENTED LANGUAGE.

- 1) DATA DECLARATION.
- 2) FORMULAS AND ASSIGNMENT.
- 3) PROGRAM CONTROL.
- 4) SUBPROGRAM DEFINITION.
- 5) COMPILER DIRECTIVES.

CLASP DATA DECLARATION EXAMPLES:

MARTIN MARIETTA

DENVER DIVISION

- 1) DECLARE FIXED MTP 24 12
- 2) DECLARE ~~INTEGER~~ 0, K, L, M = 1, N
- 3) DECLARE BOOLEAN, UP = TRUE, HIGH = ON, DOWN = FALSE, LOW = 0
- 4) DECLARE TEXT, MESSAGE 13
- 5) DECLARE INTEGER, MATRIX (3,4) = (0,-6,-48,3,4,6,4(7),59,11)
- 6) ABLE. DECLARE INTEGER, A,B,C,D
- 7) DECLARE HARDWARE I, INDEX1 = 1, INDEX2 = 2
- 8) OVERLAY A,B,D,C, = K,L,M,N

CLASP FORMULA AND ASSIGNMENT EXAMPLES:

MARTIN MARIETTA
DENVER DIVISION

- 1) $\underline{MTP} = (\underline{ALPHA} + 2) / (\underline{ZLIK} + (\underline{PI}^{***})) - 3.14 + \underline{BETA}$
- 2) $\underline{A} = \underline{MTP} \text{ LSH } 1$
- 3) $\underline{B} = \underline{A} \text{ LAND } B^1 010101^1$
- 4) $\underline{A}, \underline{B}, \underline{C} = 4, \underline{Q}/\underline{R}, \text{ABS } (\underline{Y})$
- 5) $\underline{ALPHA} (*, 4) = \underline{MATRIX} (*, 4)$
- 6) $\underline{A} = = \underline{N}$

CLASP PROGRAM CONTROL EXAMPLES:

MARTIN MARIETTA

DENVER DIVISION

- 1) STAGE. ABLE = X * Y
- 2) GOTO STAGE
- 3) GOTO (LOC1,,LOC3,LOC4)INDX
- 4) IF ALPH LS BETA
 THEN GOTO STAGE
 ELSE ALPHA = BETA
 END
- 5) FOR I = 1 BY 2 TO N
 STATEMENTS
 END
- 6) LOCK INAME
 STATEMENTS
- 7) UNLOCK INAME
- 8) ON INAME
 STATEMENTS
 EXIT

CLASP SUBPROGRAM DEFINITION EXAMPLES:

MARTIN MARIETTA
DENVER DIVISION

- 1) PROC .CALC (A, B, C = OUTPUT)
DATA DECLARATIONS
STATEMENTS
EXIT
- 2) .CALC (X, Y, Z = W)
- 3) PROC .SIN (X)
DECLARE FIXED 24 12, SIN, X, RESULT
DATA DECLARATIONS
STATEMENTS
SIN = RESULT/2
EXIT
- 4) IF X3 -. SIN (2*PI*F) GR 0.5
THEN GOTO L1
END
- 5) CLOSE .GAMMA
STATEMENTS
EXIT
- 6) .GAMMA

CLASP COMPILER DIRECTIVE EXAMPLES:

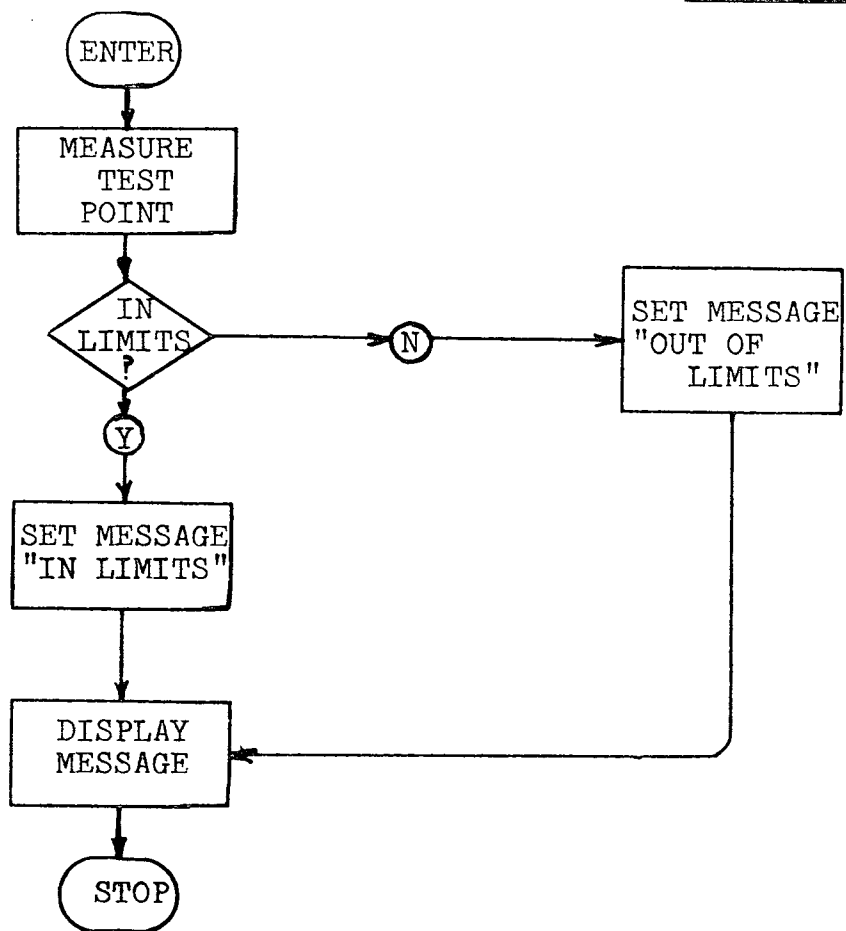
MARTIN MARIETTA

DENVER DIVISION

- 1) TRACE TEST, FIND
STATEMENTS
 - 2) UNTRACE
 - 3) COUNT (3)
STATEMENTS
 - 4) UNCOUNT (3)
 - 5) OPTIMIZE TIME (5)
STATEMENTS
 - 6) UNTIME
 - 7) OPTIMIZE SPACE (2)
STATEMENTS
 - 8) UNSPACE
 - 9) DIRECT
MACHINE CODE
- END

FLOW CHART FOR SAMPLE CLASP PROGRAM

MARTIN MARIETTA
DENVER DIVISION



START "SAMPLE CLASP PROGRAM"

DECLARE FIXED, MTP "MEASUREMENT TEST POINT" 24 12.

DECLARE TEXT, MESSAGE 13 = 1 1

DIRECT

"A DIRECT CODE PROCEDURE WOULD APPEAR HERE TO
PERFORM I/O ASSOCIATED WITH MEASURING THE TEST
POINT AND STORING THE VALUE MEASURED IN MTP."

*

*

*

END

IF MTP LS 9.9 OR MTP GR 10.1 "VOLTS"

THEN MESSAGE = 1 OUT OF LIMITS 1

ELSE MESSAGE = 1 IN LIMITS 1

END

DIRECT

"A DIRECT CODE PROCEDURE WOULD APPEAR HERE TO
PERFORM I/O ASSOCIATED WITH MESSAGE OUTPUT"

*

END

STOP "THIS SAMPLE TEST"

TERM

SPECIAL PURPOSE, TEST ORIENTED APPLICATION
TEST SYSTEM ORIENTED FIXED FORMAT LANGUAGE
TRANSLATOR-INTERPRETER MODE OF EXECUTION
PART OF AN ON-LINE INTERACTIVE MULTIPROGRAMMED
CHECKOUT SYSTEM FOR SPACECRAFT
 SELF-TEACHING.
 CONCURRENT TEST EXECUTION.
 TEST PRIORITIES AND PROTECTION.
 RESOURCE ALLOCATION.

TOOL PRIMITIVES

MARTIN MARIETTA
DENVER DIVISION

<u>NAME</u>	<u>PURPOSE</u>
AGAIN	TERMINATE DO LOOP
BEGIN	BEGINNING OF TEST
CALL	CALL A SEQUENCE
CHECK	CHECK CONTENTS OF DATA CELL
CLEAR	CLEAR HARDWARE UNIT
CONNECT	CONNECT STIMULUS SWITCH
DELAY	DELAY ELEMENT EXECUTION
DISCONNECT	DISCONNECT STIMULUS SWITCH
DISPLAY	DISPLAY ON PLASMA OR MICROFILM
DO	START DO LOOP
END	END OF TEST
EVALUATE	EVALUATE DATA
GOTO	UNCONDITIONAL BRANCH
IF	CONDITIONAL BRANCH
INTERRUPT	INTERRUPT EXECUTION ON TIME OUT
MEASURE	MEASUREMENT DEVICE CONTROL
MILESTONE	SPECIAL DISPLAY ON PLASMA
READ	READ DATA
RECORD	RECORD DATA
REPEAT FLAG	REPEATABLE ELEMENTS FLAG
START	START TEST ON CONCURRENT LEVEL
STIMULATE	STIMULUS UNIT CONTROL
STOP	STOP TEST ON CONCURRENT LEVEL
TRANSFER	TRANSMIT DATA

PLASMA DISPLAY WORK AREA:

SEQ NASA BEGIN
PASSWORD: KSC
 [TO BE COMPLETED BY OPERATOR]

MICROFILM CUE FRAME:

431 WRITE MODE
 BEGIN ELEMENT -- SELECT PROTECTION KEYS
 ENTER N NO PROTECTION
 C CALL EXECUTE INHIBIT
 K KEYBOARD EXECUTE INHIBIT
 D DELETE INHIBIT
 R REVIEW INHIBIT
 M MODIFY INHIBIT
 MULTIPLE ENTRIES MUST BE IN THE ABOVE
 ORDER AND SEPARATED BY COMMAS.
 EXAMPLE: C, K, R

PLASMA DISPLAY WORK AREA:

SEQ NASA STIMULATE
DC VOLTS SGU1 AUTO ON
[TO BE COMPLETED BY OPERATOR]

MICROFILM CUE FRAME:

554 WRITE MODE - STIMULATE ELEMENT
DC VOLTAGE AMPLITUDE
ENTER VOLTAGE AMPLITUDE IN THE FORM:
 $\pm XX.XX$; -40.00 VOLTS/PEAK $\leq \pm XX.XX \leq$ +40.00 VOLTS/PEAK
OR AS A DATA CELL NUMBER, D0 TO D9

1. CHECKOUT EQUIPMENT ORIENTED
2. UNIT UNDER TEST ORIENTED

DESIGNED TO PROVIDE A NEAR ENGLISH TEST ORIENTED LANGUAGE
FOR USE WITH THE TITAN-IIIM CHECKOUT EQUIPMENT

CAGE TEST LANGUAGE --OFF LINE TRANSLATOR

MARTIN MARIETTA

DENVER DIVISION

	ELEMENT																			
	BEGIN	END	SEQUENCE	REP/TEST	APPLY	CONNECT	STIMULATE	MEASURE	CK/ANALOG	CK/DISC	SET/ (DMS) (PCM)	DEFER/ (KEY) (TIME)	CONTINUE	SYSTEM/TEST	TIME	RESET	REPEAT	DISPLAY	SAVE	RESTORE
MODIFIER	TEST NO.	NONE	SEQ. NAME	RT NAME	CAGE NO.	CAGE NO.	D/A NO.	A/D NO.	A/D NO.	CAGE NO.	CAGE NO.	CAGE NO.	NONE	ST NAME	TIMER NO.	D/A	REP. NO'S	TEXT	TEMP	TEMP
				"P" LIST			B/G NO.	MODE	INTER-VAL	GROUP NO.	GROUP NO.	TIME VALUE		"P" LIST	INTER-VAL	B/G		MILE-STONE		
							SIN	RNG	LIMITS	ON/OFF	ON/OFF	ON/OFF			DELAY	A/D		DATA		
							FREQ	SAMPLE	COM-PUTA-TION	N/M	OPEN/CLOSE	DEF. ELE-MENTS			C/D VALUE	ALL		STA-TUS		
							LEVEL	LIMITS	RE-TAIN	DEC. TIME	ERON/EROF				C/D START	ANAL. SW. NO.		PAUSE		
							RNG	INTER-VAL	ADD, SUB DIV	COND. TEST	ALT. ACTION				C/D STOP	ANALOG		NO-GO		
							DURA-TION	SMOOTH	DATA1 DATA9		NULL, AMB, OP,LIM				PAUSE/SEQ	TIMER NO.		PRINT		
								SPS	COND. TEST							C/D		LCC		
								POINTS								DISC SW. NO.		CAGE NO.		
								COND. TEST								DISC-NO.		DE-VICE NO.		
								DATA RATE										AMB		

1. CHECKOUT EQUIPMENT ORIENTED
2. UNIT UNDER TEST ORIENTED

DESIGNED TO PROVIDE A COMMUNICATION MEDIUM BETWEEN THE TEST
ENGINEER AND THE VIKING SYSTEM TEST EQUIPMENT

1. CHECKOUT EQUIPMENT ORIENTED
2. UNIT UNDER TEST ORIENTED

PROVIDE PROCESS INTERCOMMUNICATION BETWEEN UPLINK AND DOWNLINK

ACE-S/C CHECKOUT OPERATIONS INVOLVED WITH APOLLO PROGRAM

1. CHECKOUT EQUIPMENT ORIENTED
2. UNIT UNDER TEST ORIENTED

PROVIDE FOR PARAMETRICALLY CONTROLLED SEQUENCES IN THE
SKYLAB TEST PROGRAM (ATM)

- DEVELOPED FOR SATURN, BUT NOT IMPLEMENTED.
- WOULD PROBABLY HAVE BEEN MODIFIED IF IMPLEMENTED.
- COULD BE MADE QUITE READABLE BY DILIGENT PROGRAMMER.
- IS SIGNIFICANTLY PROGRAMMER ORIENTED.
- REQUIRES MANY DECLARATIONS.
- EXTENSIVE CAPABILITIES FOR ARRAYS, LISTS, PAIR-LISTS, ETC.
- ACCOMMODATES: RCA 110A TO RCA 110A COMMUNICATIONS
PARALLEL PROGRAMS AND MONITORING
POSTING OF SUBROUTINES
ANALOGS
ARITHMETIC
- DIFFICULT MANUAL, SOME ERRORS AND OMISSIONS.

```

PROC INCREMENT,LOAD (A) AMP,EVERY (B) SEC
(A PROCEDURE WOULD FOLLOW USING A AND B AS PARAMETERS)

DECLARE EXTERNAL DOV (TRANS.SW,1=D214)

TURN ON TRANS.SW,1 ELSE GO TO TS1M1

-30/10 PULSE OFF TRANS.SW,1 FOR 2.0 SEC ELSE GO TO TS1M2
-28/00 DISO TRANS.SW,1=OFF ELSE GO TO TS2M2

DOMNTR DOV12,FTPL2,EXFCUTE BUR2
:
RELEASE DOMNTR (DOV12)

POST MONITOR CHECK,HYDRA,PRESS

SAMPLE FWD.BATT.VOLTAGE,ARRAY,3,INDEX,4, FOR 10 SEC.

DO.3 DO (J)=1,16,1 WHILE FWD.BATT.VOLTAGE GT 26.0 VDC
INCREMENT,LOAD 1.0 AMP,EVERY 5 SEC
END DO.3

M INTERROGATE DOM,$ WHAT IS THE DAY OF THE MONTH?$
REQUEST (64) VALUE,LIST,12
TRANSMIT (32) SIGNAL,LIST,7

PT9B PROC PARALLEL.TEST,9
DISO K108=ON,K102=OFF,K304=ON,PS,1=ON,BATT,2=ON
ELSE GO TO PT9S1
:
PT9S1 SYNC (1)
:
END PT9B

START PARALLEL.TEST,9 AT 5 SEC AFTER STEP SPT9
SPT9 TURN ON VOR,RECEIVER ELSE GO TO D214
SYNC (1)
:

```

- DEVELOPED FOR MANNED ORBITING LAB, NOT IMPLEMENTED.
- VERY SIMILAR TO ATOLL-II, INCLUDES ATOLL-II FEATURES.
- PROVIDES FOR CONTROL OF STATEMENT EXECUTION RATE.
- PROVIDES FOR COMMUNICATING WITH ON-BOARD COMPUTER.
- PROVIDES FOR DEFINING NEW TERMS FOR MOLTOL PRIMITIVES, E.G.
 DEFINE TURN ON AS DISO.
- MANUAL SOMEWHAT BETTER THAN ATOLL-II, SOME OMISSIONS.

DOPA APPLY DO.PROF.A, ELSE EXECUTE SEMI.1
 SET PWR.A.ON.COMMAND, ELSE GO TO CMD.CHECK
 APPLY 5.0 VDC TO UR.VDA.INPUT, ELSE GO TO A102
 APPLY VDA.STIM.ARRAY TO VDA.INPUT.LIST, ELSE EXECUTE SEMI.2
 OPEN PRESSURE.RELIEF.VALVE, ELSE RUN
 DISPATCH 23,1, ELSE EXECUTE TEST.OBC
 READ PWR.A.VOLTAGE TO PAV(1,1)

SCAN SAMPLE AILIST,AIVOLTS.ARRAY,NO.SAMPLES, 10 SEC FOR 10 MIN
 IF PWR.B.VOLTAGE LT 26.0 VDC, THEN EXECUTE SEMI.1
 INCREMENT=250
 $C=(\text{ARCTAN}(\underline{Y/X})) * 0.5$

- 1 APPLY A VOLTAGE TO OPERATE A RELAY
- 2 RELAY IS CALLED "BATTERY TRANSFER"
- 3 CHECK A RELAY CONTACT TO VERIFY RELAY OPERATION
- 4 OPERATE TIME MAY BE AS LONG AS 10 MILLISECONDS
- 5 CONTINUE WITH NEXT TEST IF "GO"
- 6 DISPLAY ERROR MESSAGE AND HOLD IF "NO GO"

ATOLL COMPARISON TEST

MARTIN MARIETTA

DENVER DIVISION

000100 NAME

ILAFF

000200 CODE

A4

001000 DISA

MDO,123

001400 DISO1

MDO,123

001500 DELY1

10 MDI111,B003100

001600 SEMI1

BATTERY TRANSFER CONTROL NO GO REF 0015

003100 TFLG1

F14,B999999

:

999999 END

000100 BEGIN ATLAS PROGRAM \$
000112 DEFINE, 'BATT TRANS CONT', SOURCE, DC SIGNAL, VOLTAGE
28.5V, CURRENT MAX 300MA, CNX HI SIJ4-202 LO COMMON \$

000122 DEFINE, 'BATT TRANS IND', SENSOR, (VOLTAGE), DC SIGNAL
VOLTAGE MAX 32V, CURRENT MAX 100MA, GT 25.0V,
CNX HI SIJ4-303 LO COMMON \$

E100121 APPLY, 'BATT TRANS CONT'\$

23 DELAY, 10 MS \$

25 VERIFY, 'BATT TRANS IND'\$

26 GO TO, STEP 100100 IF GO\$

27 DISPLAY, MESSAGE,
BATTERY TRANSFER NO GO

REF. 1001 \$

28 WAIT FOR, MANUAL INTERVENTION \$

B\$
E100100 GO TO -----\$
B999999 TERMINATE ATLAS PROGRAM \$

```
START "BATTEST"
  DECLARE FIXED,MDI 24 12
  DECLARE TEXT,MSG 5 = 'NO GO'
  DIRECT
A1.  'MACHINE CODE TO CONNECT AND APPLY VOLTAGE      *
      TO BATTERY TRANSFER CONTROL,AND READ          *
      BATTERY TRANSFER INDICATOR AND STORE VALUE,    *
      APPROPRIATELY SCALED,IN MDI.'"
      END
      IF MDI GR 25.0
        THEN GOTO NEXTEST
      END
      DIRECT
      'MACHINE CODE TO OUTPUT NOGO MESSAGE"
      END
      STOP A1
  NEXTEST.  STATEMENT
            :
            STATEMENT
      STOP
TERM
```

TOOL COMPARISON TEST

MARTIN MARIETTA
DENVER DIVISION

BEGIN	BATTEST
CONNECT	D213
STIMULATE	DC,VOLTAGE,+28.0V,AS
DELAY	0:0:10
MEASURE	DC,D512,D1,+28.0V
CHECK	LIMITS,+30.0V,+25.0V,D1
IF	IN,10
STIMULATE	CLEAR
DISPLAY	MESSAGE,AMD,ADU,\$NO GO\$

END B

10 STATEMENT
:
STATEMENT
END A
FIN

*SEQUENCE BATEST

*SEQUENCE ELEMENTS

10.0 SET/DMS,OPEN,1D747

APPLY,1D747

CK/D,1D748,ON,10MS,10.1

BEGIN 20.0

10.1 D/NO-GO,DISC,STOP

RESET,1D747

20.0 (NEXT TEST)

.
.
.

END

BGNA BEGIN BATT.TEST

DECLARE EXTERNAL DOV(BATT.TRANS.CONT=D213)

DECLARE EXTERNAL VDI(BATT.TRANS.IND=D512)

CONSOLE=A4

C102 TURN ON BATT.TRANS.CONT,ELSE GO TO BTNG

DELAY 10 MS

IF BATT.TRANS.IND IS ON,THEN GO TO NEXTEST,
ELSE CONTINUE

C

BTNG HALT \$ BATTERY TRANSFER IS NO GO C102 \$

NEXTEST ---

ENDA END BATT.TEST

- TEST ORIENTED LANGUAGES
 - PROVIDE A LANGUAGE TO ACCOMPLISH AUTOMATIC CHECKOUT TASKS.
 - AID IN ACCOMPLISHING AUTOMATION THROUGH MAN-MACHINE COMMUNICATION.
- WHY A NEW LANGUAGE?
 - TO CORRECT DEFICIENCIES FOUND IN EXISTING TEST ORIENTED LANGUAGES.
 - INCORPORATE WHAT HAS BEEN LEARNED FROM PAST EFFORT.

PROBLEMS

MARTIN MARIETTA

DENVER DIVISION

DIFFICULT TO LEARN TO WRITE

DIFFICULT TO LEARN TO READ

ABSENCE OF ARITHMETIC CAPABILITIES

LACK OF SAFEGUARDS

MINIMUM CHECKING FEATURES

CHECKOUT SYSTEM DEPENDENT